

Blister test to evaluate the multiwall carbon nanotubes (MWCNT) - Woven carbon fiber-reinforced epoxy used for repairing pipelines

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Abstract

Purpose – Pipelines are subject to pits, holes and cracks after staying in service for a while, especially in harsh environments. To repair the pipelines, composite materials are used, due to composite materials' low cost, high-corrosion resistance and easy handling. This study aims to investigate the reliability of the blister test for evaluating the bonding strength of multiwall carbon nanotube (MWCNT) on woven carbon-reinforced epoxy.

Design/methodology/approach – Flexural, hardness and Izod impact tests were used to evaluate MWCNT effect on the epoxy by adding different amounts, 0.2, 0.4, 0.6, 0.8 and 1 wt. %, of MWCNT, to be compared with pure epoxy.

Findings – The results showed that 0.8 wt. % gives the highest strength. The experimental results of 0.8 wt. % MWCNT reinforced carbon composite was compared with the finite element model under blister test, and the results showed high similarities.

Originality/value – Evaluation of the reliability and the advantages of MWCNT considering the high aspect ratio and high tensile strength, which is more than 15 times compared to steel, MWCNT enhances the strength, stiffness and toughness of epoxy used as a matrix in repairing pipelines, which leads to an increase in the resistance of composite materials against oil internal pressure before delamination.

Keywords MWCNT, Carbon reinforced epoxy, Blister test, Finite element analysis, Pipeline, Composite repair, Woven reinforcement, Nano reinforcement

Paper type Research paper



1. Introduction

Pipelines are subject to pits, holes and cracks after staying in service for a while, especially in harsh environments. To repair the pipelines, composite materials are used, due to their low cost, high corrosion resistance and easy handling (Budhe *et al.*, 2017) (Nariman, 2015), in